

Department of Agriculture to consider methods, records, etc. This committee considered the whole matter carefully and, after interruption by the war, finally recommended the establishment of 12 regional agricultural meteorological stations in the principal corn, cotton, wheat (winter and spring), and potato districts.

The fact was recognized that similar stations were established in Russia in 1896, where, in 1912, complete records were being made at 81 different points. The Canadian meteorological service recognized the great importance of such stations and had, in 1915, located them at 14 different experiment farms in different sections of the country.

The Royal Meteorological Society in England has collected systematic phenological data since 1875, and similar work has been done in nearly all European countries. A division of agricultural meteorology was established in Brazil in 1910, in Germany in 1911, and in France in 1912.

It is believed that the United States, with its splendid Weather Bureau organization and well-established chain of Experiment Stations, should not be behind these other countries in putting this needed study of weather and crops on a real scientific basis with systematic observations and records. Funds were requested for this purpose in the last estimate, but the appropriation was not allowed by the congressional committees. It is hoped that better success will be had with the next Congress.

The third method of ascertaining the critical period of growth is by correlating past records of weather and crop yields. Meteorological and crop yield data are available in some States for a period of 50 or more years and a number of studies have been published. Some of the most important ones appear in the list given below and a number of men have similar studies in hand. The field is large and much material is available. The writer is satisfied that the problem is one for higher mathematics and that it is worthy the attention of the best trained men in the country.

The American Meteorological Society can well encourage studies that will have such a far-reaching effect on agriculture as these promise.

BIBLIOGRAPHY ON AGRICULTURAL METEOROLOGY.

- Blair, T. A.**
Rainfall and spring wheat. *Mo. WEA. REV.*, Oct., 1913.
Temperature and spring wheat in the Dakotas. *Mo. WEA. REV.*, Jan., 1915.
Partial correlations applied to Dakota data on weather and wheat yield. *Mo. WEA. REV.*, Feb., 1918.
A statistical study of weather factors affecting yield of winter wheat in Ohio. *Mo. WEA. REV.*, Dec., 1919.
- Brounoff, P.**
Crops and the weather. *Bul. Foreign Agric. Intelligence*, Ottawa, Canada. Dept. of Agric., Vol. VI, 5.
- Kincer, B. J.**
Relation of weather to the amount of cotton ginned during certain periods. *Mo. WEA. REV.*, Jan., 1917.
A correlation of weather conditions and the production of cotton in Texas. *Mo. WEA. REV.*, Feb., 1915.
- Moore, H. L.**
Forecasting the yield and price of cotton. Macmillan Co., N. Y.
- O'Connor, A. J.**
Relation of weather to yield of winter wheat in Manitoba. *Mo. Bul. of Agric. Statistics*, Ottawa, Canada, Apr., 1918.
- Root, C. J.**
Relation of snowfall to yield of winter wheat. *Mo. WEA. REV.*, Oct., 1919.
- Seeley, D. A.**
The relation between temperature and crops. Reprint, 19th Report Michigan Acad. of Sciences, 1917.
- Smith, J. Warren.**
Effect of weather upon the yield of corn. *Mo. WEA. REV.*, Feb., 1914.
Effect of weather upon the yield of potatoes. *Mo. WEA. REV.*, May, 1915.
Effect of snow on winter wheat in Ohio. *Mo. WEA. REV.*, Oct., 1919.
- Other recent studies bearing on the general subject of the effect of weather and climate upon vegetation and farm management are indicated in the following list:
- MONTHLY WEATHER REVIEW.**
- Alter, J. Cecil.**
Alfalfa seed growing and the weather in Utah. (May, 1919.)
- Hopkins, A. D.**
Periodical events and natural law as guides to agricultural research and practices. (*The Bioclimatic Law.*) (Supplement 9.)
- Kincer, J. B.**
Daytime and nighttime precipitation and their economic significance. (Nov., 1916.)
Relation between vegetative and frostless periods. (Feb., 1919.)
The seasonal distribution of precipitation and its frequency and intensity in the United States. (Sept., 1919.)
Sunshine in the United States. (Jan., 1920.)
Temperature influence on planting and harvesting dates. (May, 1919.)
- Reed, W. G., and Tolley, H. R.**
Weather as a business risk in farming. (June, 1916.)
- Stine, O. C., and Baker, O. E.**
Climate of the cotton belt. (July, 1919.)
- Smith, J. Warren.**
Cultivation does not increase the rainfall. (Dec., 1919.)
Predicting minimum temperatures from hygrometric data. (Supplement 16.)
- Department of Agriculture Yearbook.*
- Baker, O. E., Brooks, C. F., Hainsworth, R. G.**
Graphic summary of seasonal work on farm crops. (Separate 758, 1917.)
- Smith, Middleton, Baker, O. E., Hainsworth, R. G.**
Graphic summary of American agriculture. (Separate 681, 1915.)
- Finch, V. C., Baker, O. E., Hainsworth, R. G.**
Graphic summary of world agriculture. (Separate 713, 1916.)
- Department of Agriculture Publications.*
- Finch, V. C., and Baker, O. E.**
Geography of the world's agriculture. 1917.
- Journal of Agricultural Research.* Dept. of Agric., Washington, D. C.
- Dorsey, M. J.**
Relation of weather to fruitfulness in the plum. (Vol. XVII, No. 3.) [Abstr., p. 285, below.]
- Agricultural Experiment Station Bulletins.*
- Alter, J. Cecil.**
Alfalfa seed growing and the weather. (Bul. 171, Logan, Utah.)
- Baker, O. E., and Whitson, A. R.**
Climate of Wisconsin and its relation to agriculture. (Bul. 223, July, 1912.)
- Spafford, R. R.**
Effect of climate and soil upon agriculture. (Univ. Studies, Lincoln, Nebr., Feb., 1916.)
- Farmers' Bulletins.* Dept. of Agric., Wash., D. C.
- Thompson, H. C. T.**
Home gardening in the south. (No. 934, 1918.)
- Young, Floyd D.**
Frost and protection from damage by it. (No. 1096, 1920.)
- Maryland Weather Service.*
- McLean, Forman T.**
Preliminary study of climatic conditions in Maryland as related to plant growth. (Special Pbn. Md. Wea. Serv., Vol. IV, Pt. 1A. Also Phys. Res. No. 2, 1917.)
- McLean, Forman T.**
Relation of climate to plant growth in Maryland. (Md. Wea. Rev., Feb., 1915.)
- American Geographical Society, New York City.*
- Arctowski, H.**
Corn crop in the United States. (Vol. XLIV, Oct., 1912.)

Society for Promotion of Agricultural Science, Wash., D. C.

Voorhees, J. F.

Relation of meteorological study to more logical systems of cropping and to crop production. (Proceedings, 1912.)

Scientific Monthly.

Hopkins, Andrew D.

The bioclimatic law as applied to entomological research and farm practice. (June, 1919, pp. 496-513.)

Journal Washington Academy Sciences.

Hopkins, Andrew D.

The bioclimatic law. (Vol. 10, Jan., 19 1920. pp. 34-40.)

Royal Society of Canada.

Adams, J.

Quantitative study of climatic factors in relation to plant life. (Transactions, Series III. Vol. X, 1916.)

The Macmillan Co.

Smith, J. Warren.

Agricultural meteorology, textbook. (To be published during summer, 1920.)

Royal Meteorological Society, London, England.

Ward, R. deC.

The larger relations of climate and crops in the United States. (Quarterly Journal, Jan., 1919.)

Dept. of Agriculture, Ottawa, Canada.

Brounoff, P.

Some considerations on the organization of the agricultural meteorological service. (Bul. Foreign Intelligence, April, 1916. Office of Can. Commis. of Internat. Inst. of Agric.)

Agricultural Journal of India, Calcutta.

Howard, Albert.

The influence of weather on the yield of wheat. (Vol. XI, Part 4, Oct., 1916.)

ABSTRACTS, REVIEWS, AND NOTES.

Maxwell Hall, 1845-1920.

Meteorologists of the world have read with keen regret the news of the death of Maxwell Hall, in Kingston, Jamaica, on February 20, 1920. Mr. Hall's 75 years of life were spent in England and Jamaica. He was born at Cheltenham, England, in 1845 and educated in private schools and later in King's College, London and Pembroke College, Cambridge, where, in 1871, he was graduated as Wrangler. In 1872 he moved to Jamaica, where he erected a private astronomical observatory and began scientific work. He was appointed Government meteorologist in 1880, a position which he held until his death. While he was of a retiring disposition, this quality did not serve to diminish his prominence in the public life. The death of Mr. Hall came unexpectedly, for, while he had not been enjoying the best of health for some time, his friends had universally held hopes of his early return to health. His cooperation with the United States Weather Bureau in communicating hurricane warnings has been greatly appreciated, and many will remember his efforts to organize and perfect a system of storm-warnings in the West Indies. He has published many articles on hurricanes, earthquakes, and other scientific subjects in the journals of the United States, England and Jamaica.

Dr. J. G. Bartholomew, 1860-1920.

[Abstract from *Nature*, London, Apr. 22, 1920, pp. 238-239.]

Dr. Bartholomew, one of the leading cartographers of the world, died suddenly April 13, 1920, at Cintra, Portugal, at the age of 60. He was a native of Edinburgh, where he received his education in the high school and at the University of Edinburgh. As a young man he entered the business (map publishers) founded by his grandfather. At the age of 29 he succeeded his father as head of this firm, which since 1889 has been known as "The Edinburgh Geographical Institute."

Early in his career he devised the method of representing topographical features by the system known as "layering," which has made the Edinburgh Geographical Institute celebrated throughout the world, and is now copied in all other cartographical establishments. It merely consists of distinctive colors, tints, or shades between successive contours on a contoured map.

In 1899 Dr. Bartholomew published "The Atlas of Meteorology," a work of immense labor with several original features, which shows even more stirring his

zeal for scientific geography, and amply justifies the motto he had adopted, "Amore et labore."

Despite his great cartographical labors he found much time to take active part in numerous scientific societies. In his private life he was held in the highest esteem by all who knew him.—*Geo. G. Chisholm*.

THE PHYSICS OF THE AIR.

With the recent publication in the *Journal of the Franklin Institute* of a paper in two installments on "Factors of Climatic Control," Dr. W. J. Humphreys has completed a series of papers that he has been publishing for more than two years in the journal above mentioned on the general subject of "Physics of the Air." It is expected that this work will soon be issued in book form. No first-rate comprehensive book on meteorology written from the standpoint of the physicist exists at present in any language, and there is perhaps no more striking gap in the literature of science. Dr. Humphreys's book will go a long way toward filling this gap. It is especially remarkable for the amount of skill and labor the author has devoted to checking, verifying—and in many cases discrediting—doctrines and ideas that have heretofore been passed on from one meteorological writer to another without critical examination.—*Scientific American*, New York, June 19, 1920, page 669.

THE APRIL 22 MEETING OF THE AMERICAN METEOROLOGICAL SOCIETY.

The *Bulletin of the American Meteorological Society* for May, 1920, pages 48-55, contains a full account of the papers and discussions presented before the American Meteorological Society which met in Washington, D. C., on April 22, 1920. The sessions, one in the morning and one in the evening, were held at the Central Office of the Weather Bureau. The attendance, 40 to 50, was very good, amounting to the combined attendance at the two previous meetings in St. Louis and New York City.

The morning session was opened by an informal address of welcome by Prof. C. F. Marvin, Chief of the Weather Bureau. Of his address, the *Bulletin* says:

He discussed the opportuneness of the organization of the society at this time, when many outside interests, awakened to the value of meteorology by its applications in the war, were now seeking to apply weather knowledge more thoroughly to peace-time pursuits. The